lasting. The work commenced by assisting a number of researches conducted by scientific and professional societies which were languishing as a result of the war, and grants were also made to the National Physical Laboratory and to the Central School of Pottery at Stoke-on-Trent. The grants for investigation and research for the year 1916–17 totalled 11,055*l.*, and for the present year are anticipated to be 93,570*l.* The total income of the National Physical Laboratory in 1913–14 was 43,713*l.*, and, owing to the great enlargement of the laboratory, the total estimate of the Research Department for this service during the current year is 154,650*l.*

Another important part of the work of the Department has been to foster and to aid financially associations of the trades for the purpose of research. Nine of these associations are already at work; eight more are approved, and will probably be at work within the next two months; and another twelve are in the earlier stage of formation. There are also signs of great increase of research by individual factories. Whether this is due to the indirect influence of the Research Department or to a change in public opinion and a more general recognition of the importance of scientific industrial research it is difficult to say.

The possibility of the uncontrolled use on the part of a nation of the power which science has placed within its reach is so great a menace to civilisation[4] that the ardent wish of all reasonable people is to possess some radical means of prevention through the establishment of some form of wide and powerful control. Has not science forged the remedy by making the world a smaller arena for the activities of civilisation, by reducing distance in terms of time? Alliances and unions, which have successfully controlled and stimulated republics of heterogeneous races during the last century, will therefore have become possible on a wider and grander scale, thus uniting all civilised nations in a great league to maintain order, security, and freedom for every individual and for every State and nation liberty to devote their energies to the controlling of the great forces of Nature for the use and convenience of man, instead of applying them to the killing of each other.

Many of us remember the president's banner at the Manchester meeting in 1915, where Science is allegorically represented by a sorrowful figure covering her eyes from the sight of the guns in the foreground. This year Science is represented in her more joyful mien, encouraging the arts and industries. It is to be sincerely hoped that the future will justify our present optimism.

## SUMMARIES OF ADDRESSES OF PRESIDENTS OF SECTIONS.

### AGRICULTURE.

IN his address to Section M, Prof. Somerville pointed out that during the war the area of land in the United Kingdom under grass was reduced by more than three million acres, with a corresponding increase of the area under tillage crops. Even were this increase of cultivated land maintained there would still remain more than 30 million acres under permanent and temporary grass, exclusive of about 16 million acres of mountain land used for grazing. Several attempts have been made to discover a relationship between the botanical composition and the feeding properties of permanent pastures, but the results have been largely negative; neither has it been possible by chemical analysis to differentiate between grass of poor and of high quality. The only trustworthy test of quality that can be applied would appear to be through the agency of animals consuming the produce of the meadows or pasturing the fields. This work was initiated at Cockle Park in Northumberland in 1897, and has been extended to some twenty other experimental stations in various parts of the United Kingdom and in New Zealand. It has been conclusively proved that poor grass land is susceptible of rapid and profitable improvement, especially through the agency of phosphates. In many cases the stock-carrying capacity of land has been more than doubled, while the progress of the individual animals has also been largely increased, so that the output of meat or milk from land suitably manured has often been trebled or quadrupled with advantage to the nation and substantial profit to the farmer. One conspicuous result of experiments on manuring-for-meat has been the long-continued action of dressings of phosphate, 200 lb. per acre of phosphoric acid in the form of basic slag still producing very marked effects at the end of nine years. Nitrogen, potash, and lime as an addition to phosphates have been tried at several stations, but in most cases with comparatively little effect. Indirect manuring through feeding stock with cake has also given unsatisfactory results.

Research during recent years has been directed towards discovering how the marked improvement secured by an initial dressing of phosphate can be maintained, and it has been found that in no way can the maintenance of fertility of pasture be better secured than by means of supplementary dressings of phosphate.

### ANTHROPOLOGY

Prof. Arthur Keith, as president of Section H, devoted his address to "The Differentiation of Mankind into Racial Types." It was maintained that an overwhelming majority of anthropologists were convinced that all varieties of living human races were descendants of a common ancestral stock, and that some varieties had departed less from the original pattern than others. There was no agreement, however, as to how the differentiation had come about. Natural and sexual selection were certainly parts of the evolutionary machinery which had given the Negro, the Chinaman, and the European their distinctive features of face, skull, and body, and also certain characteristics of mind, but it was clear that they did not constitute the whole of the machinery. Nothing was more desired by anthropologists at the present time than a rational explanation of how mankind has come by its racial characteristics.

There were many indications that the key to such problems was to be obtained by a close study of the disturbances or disorders which occasionally affect the development and growth of the human body. The disorders of growth are of many kinds; some are definitely proved to result from a functional derangement of one or more of the glands of internal secretion—the pituitary, thyroid, pineal, adrenal, and genital glands. In a manner which we are only beginning to perceive, the functions carried on in these glands regulate, not only the dimensions of the body, but also the shape and size of each individual part.

The machinery of race differentiation is resident in the growth-controlling glands of the body. The mistake is sometimes made of regarding each gland as carrying on a simple function, whereas each carried on a multitude of functions. Substances contained in the secretion of the pituitary gland not only could affect the size and proportion of the body, but also might pick out and emphasise the growth of one or more physiological systems. The same was true of the thyroid. The racial features of the Mongolian type were simulated by growing Europeans who were affected by deficiency disorders of the thyroid gland. The features of the Negro could best be accounted for by the nature of the growth-regulating mechanism centred in the thyroid and suprarenal glands. European features were connected with a dominance in the functions of the pituitary. As we came to understand the machinery of growth, matters which now puzzle us about the differentiation of varieties and species of mankind would disappear.

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[4] For instance, it might some day be discovered how to liberate instantaneously the energy in radium, and radium contains 2,500,000 times the energy of the same weight of T.N.T.

### BOTANY.

Sir Daniel Morris began his address to Section K by remarking that since the Association met at Newcastle in 1916 there has been decided progress in every branch of science, and also a fuller recognition of the value of science and education as means whereby the material interests of the world may be enlarged. A new branch of botany has lately come into prominence as one of the results of the devotion to nature study and the contemplation of the characteristic features of vegetation as we find it distributed over the world's surface. Ecology is capable of enormously extending the outlook of botany, and it has so largely added to the interest of field work that we may wonder that the phenomenon of vegetation so long displayed before our eyes had not suggested its sociological aspects long ago. It is hoped ecology will mitigate some of the admitted drawbacks of purely laboratory work and revive the old natural history spirit of former days.

Travelling somewhat outside the scope of previous addresses, an attempt was made to summarise the results of the many efforts to promote not only the interests of the homeland, but of the Empire as a whole. The establishment of an Imperial Department of Agriculture in the West Indies, followed by similar highly equipped departments in India and in such tropical colonies as Ceylon, Mauritius, Federated Malay States, Fiji, and in East and West Africa, has greatly advanced scientific research on the applied side in connection with sugar, cotton, indigo, rice, india-rubber, and other important industries. The admirable work done by Biffen at Cambridge and the Howards in India in raising new and improved varieties of wheats clearly demonstrates the value of thorough acquaintance with pure botany as a qualification for grappling with questions of economic importance.

As the result of Biffen's plant-breeding work at Cambridge, new wheats have been produced and grown over extensive areas in the eastern counties that have yielded crops at the rate of 50 to 60 bushels per acre. In one instance an area of a little over twenty-seven acres has yielded 2072 bushels, or an average of 77 bushels per acre. This is to be compared with the average yield of wheat in this country at about 32 bushels per acre. The new wheats are not only more productive, but are less liable to disease, and the quality of the flour is superior to that of ordinary English wheats. In regard to India it is estimated that the Pusa wheats raised by the Howards will shortly be established over five million acres, and it is anticipated that they will bring in an increase in the value of the agricultural produce of India, in one crop only, of 75 lakhs of rupees or five millions sterling.

Henry's researches in regard to hybrid trees and his elaborate investigation into the history of the London plane were generally regarded as valuable contributions to science. It was claimed in the case of many trees that it is possible to produce much greater bulk of timber in a given time; while, according to Dawson, the common belief that quickly grown timbers are of an inferior quality is said not to hold good in respect of any quality in ash, oak, and walnut.

It is widely felt that the most pressing of all investigations at the present time is the study of plant diseases. The recently established Institute for Plant Pathology at Rothamsted may be the means of introducing entirely new methods in mycological investigations.

It was further suggested that all research work should be organised on the broadest possible lines and combine the biological services of the whole Empire. We have a first step in this direction in the Imperial Bureau of Entomology with its headquarters at the British Museum. Those acquainted with the efficient work done by this bureau, and the valuable publications issued by it, will heartily welcome the establishment of the proposed Imperial Bureau of Mycology, at Kew, to carry on work on similar lines.

### CHEMISTRY.

The periodic law, of which this year may be regarded as the jubilee of its announcement by Mendeléeff, formed the chief subject of the address in Section B by Prof. P. P. Bedson. After dealing with the inception of this law, its utility as a means of classifying the elements, and the revision of the atomic weights demanded by it, the influence of the discovery of argon, helium, and the allied elements was reviewed, as also the important part that the knowledge of the properties of helium has played in the elucidation of the remarkable properties of radium and other radio-active elements. Some of the speculations as to the composite nature of the elements were described, and allusion was made to the confirmation of such conceptions provided by the investigations of Sir J. J. Thomson on the discharge of electricity through gases. Amongst other matters relating to the elements dealt with in the address are the deductions drawn by the late Lieut. Moseley from the examination of the X-ray spectra of the elements, which make it possible to assign a number to an element, the atomic number, which corresponds with its position in the table of the elements based upon their arrangement in the order of the atomic weights. Further, attention was directed to the remarkable facts brought to light by the investigations in radio-activity, especially the existence of elements which are indistinguishable by chemical properties, yet possess slightly different atomic weights. The concluding section of the address was concerned with some points arising from the work of chemists during the war and the awakening of the public and the Government to the importance of the chemical industries.

### ECONOMIC SCIENCE AND STATISTICS.

In the presidential address to Section F, Sir Hugh Bell reviewed the economic situation brought about by the war. Attention was directed to the extent and nature of the devastation the war has produced and the extinction of vast quantities of the wealth accumulated in the past. He commented upon the light-hearted way in which, not only during the war, but also before its outbreak, the national expenditure had been increased. A distinction was drawn between pre-war expenditure for useful purposes and the absolute waste of the greater part of the war expenditure. The address dealt with the various suggestions which have been made to cope with the situation. It was urged that none of these provides a real remedy which will assist in slowly re-accumulating the wealth which has been destroyed. This, it was contended, is the essential problem of the moment.

Sir Hugh Bell discussed questions of taxation, and distinguished between imposts of a confiscatory character, which are suggested in some quarters, and those which do not fall into this class. He pointed out the difficulties of graduation, though he accepted taxation of this character. He proceeded briefly to sketch the progress of the National Debt for the past hundred years, and to examine the change which has taken place in the foreign investments of the country since the outbreak of war. Claims on the national purse were discussed. The case of housing was dealt with, and also that of the railways. It was urged that both these must be treated from the economic viewpoint, and specially that the railways cannot be allowed to become a charge on the State.

The way in which human activities are applied to production was stated, and an endeavour made to distinguish among these. It was pointed out that the only way in which the desires of various classes can be gratified is by their having something to offer in exchange for these additional gratifications, and the necessity for greater output was insisted upon. Reference was made to the figures disclosed by the Census of Production and the examination of these by Prof. Bowley and Mr. H. G. Williams.

The difficulty of drawing a line between capital and labour was pointed out and the dependence of all classes on capital was stated. Reference was made to the proposals for nationalisation, and the difficulties of any such solution were mentioned. A distinction was drawn between the political freedom acquired within the last hundred years with comparative ease and the economic freedom now sought, which it is maintained will be much less easy to accomplish.

None of the remedies proposed touches the difficulty. We must obtain a larger product if we are to have more to divide. None of the short cuts now proposed will lead us to our goal. Can we convince those most deeply interested of the truth of this? The task is not an easy one, for promises without end are made to accomplish what is desired without pursuing the patient and laborious course which alone can lead to a happy solution.

None of these things can be accomplished by Acts of Parliament. Statutory prices and statutory hours offer no solution—rather increase the evil than lessen it. There is no royal road by which we can travel to a solution. We must by patience and mutual forbearance seek to alter the present hostile attitude.

## EDUCATIONAL SCIENCE.

Sir Napier Shaw's address to Section L had for its subject "Educational Ideals and the Ancient Universities." It started from the principle that the character of the education of the country depends upon the ideals which are displayed by the universities, particularly by the ancient Universities of Oxford and Cambridge. It showed that those ideals are confused and indistinct on account of the traditional system of government of the universities and colleges under which the university has no voice in the selection of the students who are to enjoy the privileges of membership. Students are presented to the university by the colleges which hold entrance examinations of their own, or even make use of university examinations for the purpose, while the university itself has no examination for entrance. The control of the university by the colleges impresses the competitive ideal upon the whole system. The position of the university was regarded as being as hard as that of Portia in the lottery of the caskets imposed as a condition by her father's will. The ideals of the universities were reviewed, and found to be splendid so far as the ethical side is concerned, because that depends upon success in fair competiti between students and between colleges; but, so as the intellectual side is concerned, the ideals w found to be vague and unsatisfactory because of competition between the colleges which is so s cessful on the social or ethical side. Sir Napier Sh reached the conclusion that the educational syst cannot become ideal until the traditional governme is modified in such a way as to give the universi as distinguished from the colleges, more control ov its own destiny.

## ENGINEERING.

The address of Prof. Petavel to Section G includ a brief outline of the part played by engineeri during the war and some discussion of the proble involved in industrial and economic reconstructio The feature of the day is an insistent craving f better and easier conditions of life, and this aim c be attained by increased production. The industri development obtained during the war by standardis tion and systematic organisation, the rapid progre which resulted from the stimulus to research a invention, and the immediate application of t results, indicate the path to be followed. Comple success, however, requires the willing co-operation all classes of the population, and this can be achiev only if each individual knows that his rewa will depend on, and be commensurate with, his effort

## GEOGRAPHY.

Prof. L. W. Lyde's address to Section E was "International Rivers," mainly from the political a historical points of view, nearly all internation problems to-day being explicitly or implicity depende on access to the ocean. The word "river" by itse suggests a physical unit, on which a political unit ma be appropriate; but the qualifying word "inte national" suggests regional relations, not local unit In the United States and Australia it has been foun necessary for the Commonwealth to have suprem power over the regulation of the rivers (for irrigation and no individual State has any local standing riparian claim against the Commonwealth.

The same principle should hold in Europe f navigation, at least on all important rivers. Freedo of navigation is really dependent on the administration, as has been proved on the Danube betwee different nations, and on the Rhine between differen parts of the same nation, Prussia having persistentl hampered the development of other German States As international rivers are *world*-features, their world relation is the first consideration, and it demand world-control, *i.e.* control by a body consisting of non riparian as well as riparian Powers. This is reall in the interest also of the *weaker* riparian States, a proved on the Danube.

France has a very honourable record, and Hollan a very tarnished one, in relation to the problem Once on the Rhine, France declared and worked fo real freedom of the river—in 1792 and followin years; and it was only while France was submerge after 1815 that the good work was undone. Hollan was able, meanwhile, to neutralise all the advantage granted by France. By legal quibbles and "voluntary negligence" she has completely crippled Belgia use of the Maas, the Terneuzen Canal, and the Scheldt—showing a pardonable human selfishness, but an unpardonable blindness to her own ultimate advantage.

## GEOLOGY.

Dr. J. W. Evans in his address to Section C considered, in the first place, the methods by which the progress of geological research could be promoted most effectively. He emphasised the need for a large and widely distributed body of workers to carry on geological research, and discussed the means by which a wider interest in geology might be stimulated. Dr. Evans thought that much might be done to popularise the work of the Geological Survey. He advocated the issue of cheap colour-printed editions of the 6-in. maps of agricultural as well as of mining areas, with sections on the same scale, which would be more easily understood than maps and sections on smaller scales. A simple explanatory pamphlet should be published for each map, describing briefly and in popular language the meaning of the geological colouring and symbols employed, the nature of the rocks and their relation to agriculture, water-supply, and other economic questions. If these and other measures suggested involved some extra expense, it would be well worth while if it enabled the fullest advantage to be taken of the expenditure incurred in any event by the Survey. Dr. Evans contended that those engaged in genuine geological research should be assisted by concessions in the matter of railway fares. He advocated a systematic underground survey by means of deep borings, and the investigation of the geological configuration of the sea-bottom. The address then discussed in some detail the application of experimental methods to the determination of the conditions under which igneous and metamorphic rocks have been formed. The possibility was also suggested of obtaining further information as to the structure of the earth's crust by means of observations of vibrations originated by artificial explosions, and reflected from subterranean surfaces of discontinuity.

### MATHEMATICAL AND PHYSICAL SCIENCE.

In his presidential address to Section A, Prof. A. Gray dealt in the main with the utilisation of scientific knowledge and the employment of scientific men in the conduct of the war. He directed attention to the fact that the organisers of the details of our share of the defence against the German attack were without scientific knowledge, and therefore unfitted to counter the assaults of a war machine perfected by decades of hard work in a country where every available agency had been carefully organised to ensure success and victory. Our military chiefs—the War Office Staff and the rest—seemed to have no idea except the naïve and simple one of destroying Germans by rifles, machine-guns, etc., which in point of fact were, tc a great extent, non-existent.

Prof. Gray proceeded to describe a scheme of organisation and registration of scientific workers which he believes might have been adopted early in the progress of the war, and still advocates for future eventualities. He then dealt with the entire ignorance of science, apparently even contempt for science, which characterises the statesmen of this country. This he attributes in great measure to our present fashionable but archaic system of education, which takes no account of entirely new provinces of knowledge, and leaves the members of the well-to-do and upper classes quite untrained as regards one side of their minds, and therefore destitute of scientific imagination. Glaring examples of this deliberate neglect of science were cited. The remedy proposed is a radical improvement of our educational system, which ought to be helped and stimulated more by the concerted action of scientific men themselves.

The methods of encouraging and testing inventions during the war were criticised, and a better system was advocated. A strong plea was advanced for an organisation of scientific workers to secure for themselves proper recognition and proper reward for their labour. If care is not taken, a new era of exploitation of the men with ideas will begin, and will be worse than the former one.

The organisation of research was also shortly discussed, and the distinction between industrial and purely scientific research emphasised. The importance of leaving the latter perfectly untrammelled by bureaucratic control was insisted upon

The remainder of the address was devoted to some details of methods of dynamical teaching and with some recent results of physical research.

### PHYSIOLOGY.

The president of Section I, Prof. D. Noël Paton, considered the possibility that the guanidin part of the protein molecule exercises a physiological action, just as the amino-acids manifest a physiological action in stimulating the metabolism and increasing the production of heat.

The probable liberation of guanidin from protein and its formation from substances in the egg were considered. The existence of free guanidin or methyl-guanidin in muscle and its physiological action in stimulating the outgoing neurons of the spinal cord and the neuro-myal junctions were dealt with. Its increase in tetania parathyreopriva and in idiopathic tetany with the production of their characteristic symptoms was described.

The fate of the free guanidin or methyl-guanidin was discussed, and the probability of its being detoxicated by synthesis into creatin was supported by the experimental investigations carried out along with Wishart, which showed that the creatin of muscle is increased after intravenous injection of guanidin sulphate. The significance of urinary creatin was then considered in the light of these conclusions. The advantages of studying this on such animals as birds where creatin alone is present were pointed out, and in the light of Prof. Paton's previous work the conclusion was arrived at that, in fasting, the creatin excreted is an index of the breakdown of muscle, and that by considering the creatin excretion along with the excretion of total nitrogen an estimate may be formed of the relative extent to which muscle and other tissues are being disintegrated. The evidence as to the fate of creatin in the normal animal on an adequate supply of carbohydrates seemed to indicate that creatin may again be built into the substance of muscle, that it may act as an anabolite.

### ZOOLOGY.

The presidential address by Dr. Dixey in Section D began with a brief reference to the effect of the war upon scientific research and upon the estimation in which scientific subjects are held by the general public. It was urged that while the general attention is more easily attracted by the achievements of applied science, the claims of science for its own sake should not be overlooked. A more assured place for scientific subjects in a general education was advocated, and it was suggested that much time might be gained by an improvement in the present methods of instruction; particularly in the teaching of classics.

The main part of the address was devoted to a discussion of certain features of insect mimicry, with especial reference to certain groups of butterflies inhabiting New Guinea and some of the Malayan Islands. The verification of a prediction made fifty years ago by Alfred Russel Wallace was noted, and attention was directed to the geographical element in the phenomena that have to be explained. The parallelism between the respective species of two distinct genera was illustrated and discussed, and instances were adduced of a mimetic form uniting in its own aspect the warning colours, or "aposemes," of two distinct models. Various objections to the theories of Bates and Müller were noticed, and it was contended that the facts at present known are more favourable to an explanation based on the principle of natural selection than to any other as yet offered. It was admitted that this involves the recognition of adaptation as influencing the development of the colour patterns in question, and it was allowed that the pursuit of the "new teleology" may, like other biological speculations, have been here and there carried too far.

The address ended by emphasising the value of scientifically managed collections of insects in their bearing upon biological problems.

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## NOTES.

We are informed that the office of Scientific Attaché at the American Embassy is being closed; the question of the closing being permanent or not is, however, under discussion, and it is possible that the office may re-open in the course of a few months. The Scientific Attaché in London has been the representative of the Research Information Service of the U.S. National Research Council, and the Service will in future be glad to receive communications addressed c/o the National Research Council, 1023 Sixteenth Street, Washington, D.C., U.S.A.

We learn from *Science* that an American Meteorological Society is in course of formation, and that it will be definitely organised at the meeting of the American Association at St. Louis in December next. The purpose of the society is to fill the need for an easy interchange of ideas among those interested in atmospheric phenomena and their effects on man, and thereby to promote instruction and research in these subjects. It is pointed out that these objects may be brought about by general meetings with the American Association and local meetings at other times; by the use of the *Monthly Weather Review* as a medium for the publication of meteorological and climatological articles; and by the issue of a monthly leaflet containing news, announcements, notes, and queries.

No one is better qualified than Lord Walsingham to express the high estimation in which the late Frederick Du Cane Godman was held by all who knew him, whether in his scientific or in his private capacity. The appreciation of his lamented friend, which has been reprinted by Lord Walsingham from the Proceedings of the Entomological Society of London, speaks in fitting terms of the immense service rendered to the systematic study of natural history by the zeal and generosity of Godman. The sixty-three volumes of the "Biologia Centrali-Americana," the whole expense of which was borne by him, is a splendid monument to the labours of this great naturalist and of his friend and associate, Osbert Salvin. All those who were ever in his company will agree with Lord Walsingham that "there was a peculiar charm of personality which pervaded his whole nature; a generous sympathy with all those whose tastes, pursuits, or studies were kindred to his own; a genuine desire to help, encourage, and enlighten their efforts, and to contribute to the objects for which they were striving." It is intended to establish a memorial to Godman in connection with the British Museum, of which he was an active and efficient trustee.

Prior to the war the Wireless Society of London appointed an advisory committee to assist the officials of the Post Office in sifting their numerous applications for licences and recommending those which should be accepted. We now learn from the hon. secretary of the society that the offer of the services of the committee has again been accepted in the same capacity. Several questions in connection with the proposed new licences have still to be decided, particularly with respect to transmitting, but we gather that the genuine experimenter and the amateur who is prepared to conform to reasonable regulations may depend upon the society doing all that can be done at the moment to further their interests.

In the *Queensland Geographical Journal,* issued in a single number for the years 1916–18, Mr. R. H. Mathews describes the ceremony of initiation, known as Dyer-va-val, amongst the Birdhawal Tribe, whose hunting grounds were situated in the north-east corner of the State of Victoria. There are interesting points of resemblance to the similar rite practised by the aborigines of some northern rivers of New South Wales. During the long course of instruction, which began when the novices were separated from their mothers until they were finally recognised as men, they were taught which foods were lawful and which were taboo. On certain occasions they were taken to the place where the women were assembled, when their mothers and other female relatives gave them vegetable food, and authorised them to eat a particular vegetable from that time onward. On another day, the boys were brought up, and the women gave them water in a native vessel, after which they could drink from any stream in the tribal territory.

The United States National Museum possesses a considerable collection of examples of ecclesiastical art, a catalogue of which has been prepared by the assistant curator, Mr. I. M. Casanowicz, and issued as No. 2287 in vol. lv., Proceedings of the Museum. The pamphlet is something more than a catalogue, as the compiler has collected a considerable amount of information on the subject. He divides the catalogue into: (1) Ecclesiastical Art of the Roman Catholic Church; (2) of the Eastern Church; (3) of the Armenian Church. With this is given a collection of illustrations of the more important exhibits. Much further material, we are told, remains in storage owing to lack of space.

An exceptionally interesting bionomic study of a group of insects is found in Mr. John J. Davis's "Contributions to a Knowledge of the Natural Enemies of Phyllophaga" (Bull. Illinois Nat. Hist. Survey, vol. xiii, art. 5). This is a genus of chafers which in North America have much the same economic importance as the cockchafers and their allies have in Europe, the adult beetles eating leaves and the larvæ devouring roots. Black digger-wasps (Tiphia) "are without doubt the most efficient and abundant of the many parasites known to attack Phyllophaga," but the Tiphiæ are themselves parasitised by larvæ of bombylid flies. In his elucidation of such life-relations the author gives much information on the structure and habits of parasitic and predaceous insects of various orders. The importance of birds and mammals (including the domestic pig and the notorious skunk) as devourers of the "white grubs" is also illustrated.

Those fascinating tunicates, the Salpidæ, form the subject of an important recent memoir by Maynard M. Metcalf (Bull. 100, U.S. Nat. Mus., vol. ii, part 2), who gives anatomical details of the nervous system and musculature in many species, a "taxonomic study" of the whole family, and an interesting discussion on their distribution. He believes that "while the comparative anatomy of the adult tunicata tells us